THE AGRICULTURAL STUDENT.

VOL. V. OHIO STATE UNIVERSITY, COLUMBUS, NOVEMBER, 1898. No. 3.

TERMS OF SUBSCRIPTION:

One Year,	$ .50
One-half Year,	.30
Single Copies,	.05

While this magazine is published with the approval of the President of the University and the officers of the College of Agriculture and Domestic Science, the editors are responsible for the statements in all unsigned articles.

Address all communications to the Business Manager, Agricultural Student, Columbus, Ohio.

Entered at the Post-office, Columbus, O., as second class matter.

PUBLISHED MONTHLY BY

THE AGRICULTURAL STUDENT PUBLISHING COMPANY.

JOHN F. CUNNINGHAM, - - - - - Editor.
W. D. GIBBS. - - - - Business Manager

STAFF.

F. S. JOHNSTON. C. B. STEWART
M. IMES. L. C. WARDEN.
V. H. DAVIS.

EDITORIAL ETCHINGS.

Some "friends of education" in Ohio continue to rail against the policy of the Ohio State University in overstepping the original intentions of the framers of the Land Grant Act. The latest heard from this source is from the Central Ohio Conference of the Methodist church, and we quote from the Western Christian Advocate of September 28, 1898, page (11) 1235, report of the proceedings for the second day:

"Dr. Belt offered resolutions which passed, asking the legislature of the state to prevent the Ohio State University from the absorption of the other colleges of the state." This then is one reason why so many persons are denouncing the State University—because, in its up-to-date methods it is becoming recognized as good, and is receiving students that otherwise might go to the denominational schools of the state. Is there not much good to be done right here? If the opportunities at the State University are so great that the young men and women of the state prefer it to other institutions, should not the people of the state feel proud to possess such a school? Would it be fair, because one man, by his own exertions, was successful in business, for others (in the same business), to force him to stop his successful practice? Apply the same to this case.

The report for the same day continues as follows: "That we emphatically protest against the unjust policy of the Ohio State University as determined by the Ohio Legislature; and that we petition the legislature to so change the basis of the Ohio State University, so long as it is supported by public taxation, as to make it exclusively a post-graduate school, and leave the work of the college education to the denominational schools of the state."

And still those same persons cry that the University is overstepping the original intentions of the Land Grant Act!

Without commenting further upon the foolishness of the above quotation, we quote the following from the original act, where, in Section 4, referring to the money from the sales of the land under the act, it says it shall be used for the "endowment support, and maintenance of at least one college where the *leading* object shall be *without excluding other scientific and classical studies* and including military tactics, to teach such branches of learning *as are related* to agriculture and the mechanic arts, in such manner as the legislature of the states may respectively prescribe, in order to promote the *liberal* and practical education of the industrial classes in the *several pursuits and professions* of life."

Is it sane for one to propose keeping within the limits of the foregoing provision, and then to suggest a post-graduate school? We leave you, reader, to answer the question for yourself.

Many students, more especially those in the technical courses of the University, rather object to devoting so much time to the study of the English language as their courses may require. To say the least, this is not the correct way for the student to look at the matter. There are few who cannot, with great advantage, devote much time to the study of language and methods of expression, and to one whoever expects to take any part at all in public affairs, or to write for publication, a thorough course in "writing" is invaluable.

Everyone, and beginners in particular, should be extremely careful as to how they express themselves in writing. A grammatical error is often more costly than an error in the technical statements of an article since it will be noticed by nearly everyone, while the truth of a statement can be judged only by those who are familiar with the subject concerned Perhaps the best way to begin a correct use of English is to watch our use of the language in conversation. By perfecting himself in conversational English, one will make himself more guarded in writing.

PERSONAL ITEMS.

The Indiana Horticultural Society, one of the strongest organizations of its kind, expects to devote one session to the subject of forestry at its coming annual meeting. Dr. B. E. Fernow, of Cornell, and Prof. Lazenby, have been invited to deliver addresses at this meeting.

Mr. E. Mead Wilcox, '96, who is now spending his second year at Harvard, is pursuing his botanical studies with all his old-time ardor and enthusiasm. His thesis for the degree of Doctor of Science is on the subject of "Dormancy in Plants." He expects to attend the next meeting of the Ohio Academy of Sciences, which is to be held in Columbus during the Christmas vacation.

Prof. E. E. Bogue, of the College of Oklahoma, writes Prof. Lazenby that his colleague, Prof. Bone, is sick with what appears to be an attack of fever. He further states that the rainfall this season has been quite remarkable for that western country, 40 inches having already fallen since the beginning of the year.

Mr. C. W. Waid states that for the present his address will be Morenci, Mich., where he expects to teach during the coming winter. Referring to the death of Mr. F. A. Henderson he says "this is another sad event for us to place on the tablets of memory. He was ever a kind, true and sincere friend; one of those earnest young men of whom the world has great need."

K. C. Egbert, a graduate of the College of Agriculture, '90, is now engaged in the work of "Education of Indian Youth for the Privileges and Responsibilities of Citizenship." He is superintendent of the Indian boarding school at Yainax, Ore., securing the place through competitive examination. Connected with this school is a farm of 2500 acres, which is under the management of the superintendent.

Homer C. Price, who is taking advanced work in agriculture and horticulture at Cornell, writes that he is very much pleased with his surroundings and thinks the prospect favorable for an equally pleasant and profitable year.

All students who are interested, especially those connected with the College of Agriculture, are most earnestly and cordially invited to attend the regular monthly meetings of the Columbus Horticultural Society. This is one of the oldest and best known societies in the state. Its object is the promotion of horticulture in all its branches. The re-

port and papers presented at the meetings, and the discussions thereon, are invaluable to the student of horticulture and of great interest to all.

The meetings are held the last Saturday in every month in Horticultural Hall.

A student of last winter's course in dairying writes:

"I have been getting along fine in creamery work. I had my wages raised once where I am and now I have a new position which will pay me more than this creamery can afford. I make the change November 1st. I get $100 per month and pay my own helper, which will be about $25, so I will have $75 left. I like the work very much and intend to study and work myself up as high as I can. I would like to take the winter course at the University some time again, but I want more practice first. One of the stockholders talks of taking the creamery course, so I would like to have two or three of this year's catalogues. If you will be kind enough to send me them I might send you some scholars if you have room for them."

The Ohio Dairy School.

The Ohio Dairy school opens its fifth annual session on Wednesday, January 4th, 1899, and continues ten weeks. This offers a young man of energy and ambition an opportunity to improve his time instead of idling his winter months away. There is a broad field of work open in dairying. There is a strong and growing demand for good butter; good cheese; and pure wholesome milk and cheese; and the man who can make these products is well paid for his work and skill. Poor butter, poor cheese and poor milk are not wanted; and the man who makes and puts upon the market such goods is likewise poor. Dairying is an art and a science. If you would learn right attend some dairy school. Your total expenses for the ten weeks at the Ohio Dairy School need not exceed $60. If you are a young man of ordinary ability, you can earn enough more the first year to more than pay the entire expense of the course. This school has a large and able corps of instructors and it is no exaggeration to say that the facilities for instruction are something extraordinary.

A postal card addressed to the Dean of the College of Agriculture and Domestic Science, Ohio State University, Columbus, will bring you a handsome illustrated circular fully describing the work of this excellent school.

Generous Prizes for Judging Dairy Cattle.

W. B. Smith & Son, the well-known breeders of Holstein-Friesian cattle, Columbus, O., have offered $35 in cash in prizes in addition to badges for judging dairy cattle to the students in the College of Agriculture and Domestic Science of the Ohio State University. Thirty students will compete for these prizes, which are restricted to beginning students in the subject of Animal Industry.

All interested in this subject will give their heartiest approval to this encouragement to improvement of dairy cattle.

The Courses in Domestic Science.

Two years ago the Ohio State University recognized the demand for a broader education for young women, by introducing the Course in Domestic Science.

The course was planned not particularly for city, nor for country girls, but in the hope that it might appeal to the most womanly side of all women.

The desire was, and is, that by the practical and scientific study of home problems women may see more in household duties than a mere routine; and that by understanding the principles underlying economics, and by applying these laws in her particular realm, the wife may help to build not only a more ideal home, but a more ideal nation.

The course as here outlined aims to give first a broad foundation in the sciences, language and arts, and then to apply this knowledge to living, in the broadest sense of the term.

DOMESTIC SCIENCE LABORATORY, HAYES HALL.

The study of chemistry, botany, zoology and physiology makes it possible to understand the functions of various organisms, and to appreciate the changes constantly taking place in plants and animals. The analysis of foods and experiments with their effects upon the system, develop laws of wise living and so insure better physiques, intellects and morals. Economics certainly need to be understood and practiced no where more than in the home. History, language, literature, pedagogy and art all aid in broadening our knowledge of life and the people about us, and must add greatly to the possibilities for general pleasure and improvement.

The art of the past should appeal to us, not only because of its beauty, but because it is a nucleus about which we may build a more symmetrical future. Personal appearance, comfort and health are not of small consequence, but merit consideration on the part of everyone, and when science and art are equally balanced, the home will mean infinitely more than it does at present.

There can be no education too broad or too comprehensive for the preparation of home life; yet the connecting link between the school and the family seems to have been lost, or better, perhaps, is just being forged. It is this link that domestic science seeks to put in place. It is believed that such a training for young women will not only make all life fuller and more useful, but will help to bridge the time between school and the serious assumption of responsibility. The return of a young woman from college ought not to be, as is now so often the case, the entrance into a strange realm; but the new environment ought to appeal to her at once, urging her to activity because she is already

interested, not alone in political economy, but in domestic science—not alone in the history of the past, but in making the home history of the present and future. In these new surroundings, she will find problems as difficult of solution, and questions as vital, as any which have before this claimed her attention. It is a psychological fact that we become interested in and learn to love that which we know most about; yet many young women of our generation are permitted, even expected, to know more of almost everything than of home and its duties and privileges. This may be so because many are sent away to school when very young; but those at home, in the stress of school life, with music or art to occupy every moment not actually required for recreation, have little energy or opportunity for home duties. Such duties to daughters of the wealthy are often almost mythical; while to the poor these duties are so real as to be a terrible burden. In neither position is the young woman able to realize their true import. The small knowledge of the one is all theoretical, of the other all practical, and both breed dislike of home work—with the first because she has no conception of its importance or meaning, with the second because she has been wrongly worked and overworked.

Among the Newspapers.

It may be interesting to some who do not know the Ohio State University to learn just what the general agricultural press of the country thinks of the institution. We take it for granted that all ex-students, students, alumni, and everyone who is, or has been connected with the University, will be interested. From the "Rural New Yorker" of August 20, we take the following:

"In 1896, the Ohio State University established a chair of domestic science and a four-years' course leading to the degree of Bachelor of Science. It was felt that women require something more than the ordinary literary and scientific course, to be equipped for their special work in the world. * * * * We like the term 'domestic science laboratory'; it dignifies the kitchen with its true position. The course given includes agricultural chemistry, zoology, entomology, botany, horticulture and floriculture, hygiene and physical training, physiology, drawing and house designing, in addition to literature and languages. The aim is extremely broad; not a narrow course of technical training, but a study of the underlying principles of economics. The scientific study of home life and work will tend to offset the disposition, on the part of educated women, to crowd into business or professional life, irrespective of actual need. We believe that there is a greater need for broadly-educated, well-balanced women in the home than in business life. The school of domestic science offers one answer to the vexed question as to what we shall do with our daughters."

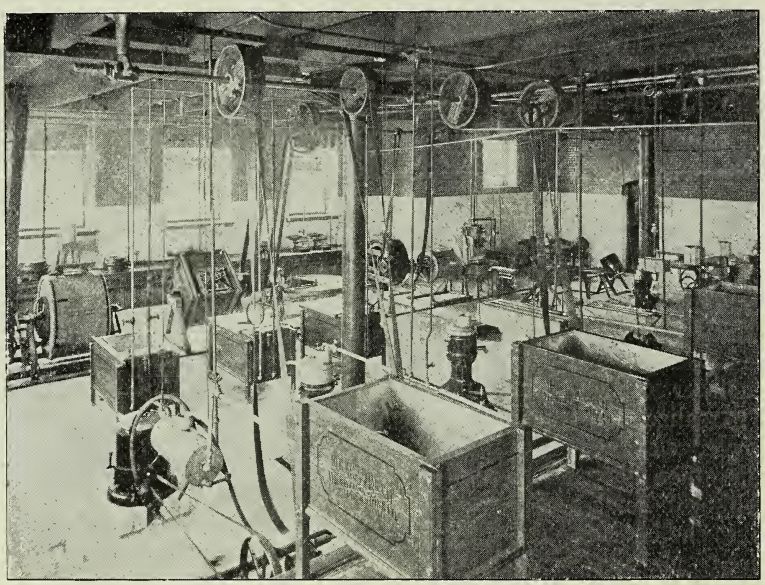
—:—:—

From the "National Stockman" of September 29 we take the following editorial:

"A farmer of Crawford county, O., asks several questions with the request that they be answered here. He writes: 'Could you give me some information in regard to taking a course in the Ohio State University? Would it pay me to spend the winter there? Could I study soil chemistry, entomology and live stock judging? Do you think it would pay me to attend lectures there without much study? As I have two farms to manage my time is pretty well taken up. Unless I can arrange to take a course of study there this winter I shall commence the study of law. Lawyers seem to have a better chance to rise in the world and to do good than farmers.'

"For information about the School of Agriculture we refer him to Prof. Thomas Hunt, of Columbus. It is almost impossible for any one to answer these questions as well as the inquirer can after a proper study of the matter. Much de-

pends upon the student, and on the use he makes of his education; but we believe it will pay a man with two farms to take a course in agriculture. There is one point in this letter to which we feel like calling attention. The inquirer is in doubt whether he should spend a winter in the study of agriculture, and speaks of merely attending some of the lectures. This is certainly commendable if it is impossible for him to take an agricultural course; but would he approach the study of the law or any other business in the same way? The science of agriculture and stock breeding and feeding is as long as the law, and like the law presents new problems constantly. As to the last sentence of his letter there may be a difference of opinion. Certainly no one would advise a young man who desires to be a lawyer to become a farmer, and vice versa."



BUTTER MAKING ROOM, TOWNSHEND HALL.

The "National Stockman" of September 1 presented a cut of the cheese making room in Townshend hall, with a short description of the dairy laboratory.

—:—:—

From the "Ohio Farmer" of August 25, we quote:

Higher Practical Education.

"There has been a rapid development in agricultural education in the several state colleges or universities of the United States since the enactment of the second Morrill act, 1890. For example, in the Ohio State University in 1890-91 there were only 31 students in the School of Agriculture, while in 1897-98 there were 144, including the lady students in domestic science. The College of Agriculture has increased nearly fivefold, but the number of students in the whole University has only a little more than doubled. This relatively rapid increase of agricultural students may be attributed to several causes.

"1. To an able body of instructors in agriculture, horticulture, veterinary medicine, agricultural chemistry, economic entomology, and related sciences. These instructors have not been devoting their time chiefly to making experiments or to teaching other branches of study and incidentally teaching agriculture, but they have been devoting their whole time and energy to agriculture and its related subjects.

"2. The students themselves have been a superior class of young men who could hold their own in the class room with the students of the other colleges of the University, and consequently have had the respect of the student body. A university is the most democratic institution in this country of democratic institutions. Character and intellectual force count here as perhaps nowhere else in the world.

"3. The board of trustees gives to the county boards of agriculture the privilege of granting a free scholarship in the College of Agriculture each year. This scholarship is good for two years and has been the means of bringing many worthy young men to the institution, although there are still a number of counties that have not availed themselves of this privilege.

"4. As far as possible the work upon the farm, in the dairy, gardens, and greenhouses is done by students. For example, the University pays about $1500 for labor in its dairy each year. This work is done exclusively by students and is divided among eight or ten young men. From $4000 to $5000 are paid to students for work upon the University farm and campus each year. Much of this latter work has little to do directly perhaps, with the agricultural instruction which the students receive in the class room, although it is the testimony of many of the young men that it has much instructional value as well as being the financial means which enable them to pursue their work in college.

"5. The College of Agriculture of the University has always had the cordial support of the trustees as well as the faculty of the University. This led to the establishment of the dairy school in 1895 and through the cooperation of the legislature, to the erection of Townshend hall in 1896-97, probably the finest agricultural building devoted exclusively to agricultural instruction, that has ever been erected. We gave a fine perspective view of this building in our issue of Sept. 9, 1897. With its new building and equipment, with its corps of instructors, devoting themselves exclusively to the instruction, and with nearly 150 young men and women of high character and attainment, we are proud to be able to point to the Agricultural College of the Ohio State University as probably the peer of any similar institution in the world.

"Young women as well as young men, we repeat, for in 1896 the trustees and faculty established two courses in domestic science, a two-year and a four-year course designed, while giving a young woman a liberal education, to train her also in the duties of womanhood. This school of domestic science has its home in Hayes hall, erected for the instruction in the industrial arts, and named for ex-President Hayes, who was earnest in promoting its erection. A small cut of this building is found on our 'Home' page this week.

"We believe we render our readers a real service by thus prominently calling their attention to our great State University. The work in its other colleges—of arts, philosophy, science, literature, classics, etc., is much of it well done in other worthy colleges or universities of the state, but the work in agriculture, horticulture, agricultural chemistry, and science, and mechanical and mining engineering is adequately done nowhere else in the state. The State University has within two years expended over $300,000 on buildings and other permanent equipments, and the greater part of it has been along those practical lines of training not adequately furnished at any other college or university in the state. It seems to us eminently wise that the farmers who pay about half of the state tax, should avail themselves of these excellent opportunities here offered."

—:—:—

The "Creamery Gazette" of September 15 contains an article of a column and a half upon the Ohio dairy school. While we have not the space to reproduce

the entire article, we note the following statement from that paper:

"The Ohio dairy school differs in externals from several other dairy schools in that its work is not located in a separate building, but is deliberately planned as a part of the work conducted in the new and magnificent building, Townshend Hall, which has been erected at the Ohio State University at a cost of over $100,000. All the work of the dairy school, including even judging of cattle, is done under one roof, except the work in bacteriology. At the same time all the technical work of the department of agriculture, as well as agricultural chemistry, is done in this building. It is over one-eighth of a mile around Townshend hall, and it is three stories high, so that there is ample room for the dairy department, which occupies six thousand square feet of floor space on the ground floor, not including bath room, locker room, toilet room and class rooms."

—:—:—

We note with pleasure that the "Elgin Dairy Report" of September 26 quotes the article that appeared in the September number of the "Agricultural Student Magazine." Before quoting the article it comments as follows:

"In the current issue of the "Agricultural Student" of Columbus, O., devoted to the interests of the Ohio Agricultural College, we find an account of the work of handling milk by the students of the dairy department. We are pleased to note this, as it shows that practical work is being done, and the supplying of sanitary milk will be an object lesson to the dealers and consumers of that city."

We wish to say that we are pleased, indeed, to see this favorable turn of the agricultural press toward the State University, and we believe that it should continue, and we trust it will, since the two institutions are engaged in the same line of work, that of educating the people. They must go hand in hand to achieve unnatural makeshift or sham, and has the best results. The college gives a man or woman the foundation upon which to build, but it remains for the press to keep them posted upon the advances in the sciences and arts. Thus the press may be said to be an institution distinctly educational, and we say again, "May the press and the State University ever stand together for the same cause."

Humus in Its Relation to Soil Fertility.

(Continued from October Issue.)

Most, if not all, of the changes that occur in organic matter is the result of the action of microscopic organisms. Humus furnishes a medium peculiarly adapted to the activity of these organisms. The decomposition of humus is due chiefly to nitrification and de-nitrification. The nitrifying organisms break down the nitrogenous constituents of the humus and produce nitrates. The de-nitrifying organisms complete the work by feeding upon the nitrates, producing free nitrogen gas, which escapes into the air.

Nitrification is one of the most important provisions for rendering the fertility of the soil available to plants, and a certain amount is necessary to plant growth. But under injudicious management and cultivation of the soil, it may work a positive injury by causing unnecessary waste of the nitrogen, or it may supply the crop with an excess of nitrates, and thus produce a rank growth of straw and leaves.

Bare summer fallowing has proven very beneficial to the succeeding crop by increasing the available nitrogen of the soil, but frequently more nitrogen is rendered available than is needed by the following crop, and nitrogen is lost. The available nitrogen is increased, but the total nitrogen is decreased.

Fall plowing keeps the humus and nitrogen in better condition than late spring plowing. Nitrification goes on most rapidly near the surface; therefore, in early fall plowing the available

nitrogen formed from the humus is near the surface, where it does the young plant the most good, while in late spring plowing this available nitrogen is plowed under and inert organic nitrogen is brought to the surface.

Deep plowing and thorough cultivation aids in nitrification, hence the longer the soil is cultivated, the deeper and more thorough must be its preparation.

The application of lime and wood ashes aids in the reduction of the nitrogen of humus. Good drainage is also necessary to nitrification in the soil. The burning over of soils is another cause of loss of humus in prairie and forest regions. An average prairie fire will remove more nitrogen than five crops of wheat.

Besides being a great reservoir of nitrogen, humus is an indirect means of supplying the plant with fertilizing constituents. Humus, as it occurs in the soil, is combined with potash, lime, phosphoric acid and other compounds essential to plant growth. The decaying animal and vegetable matter form various organic acids which combine with potash, lime, iron and alumina, forming a series of compounds known as humates, of which but little is definitely known. The mineral matter, combined with humus, is not always of the same nature, and the subject has not been extensively investigated. Hilgard says that the amount of phosphoric acid usually found associated with humus varies from 0.1 to 0.5 of the total amount in the soil.

The value of these various forms of humates as plant food has been the subject of extensive investigations, and many experiments indicate that the humates, when acted upon by the proper microorganisms, are very valuable forms of plant food.

Experiments and observations in the field strongly indicate that plants have the power of feeding on humates. It then becomes important to determine to what extent the addition of animal and vegetable matter to the soil is capable of effecting the amount of available plant food in the soil. At the Minnesota Experiment Station it was clearly shown that the amount of mineral matter combined with the humus was increased by the application of manure. The lasting effects of stable manure as a fertilizer is undoubtedly due to the power which the manure possesses of uniting with the soil potash, phosphoric asid, etc., to produce humates.

Besides performing the functions heretofore mentioned, humus profoundly modifies the physical properties of soils, probably more marked in relation to water content and temperature than in any other line.

A soil rich in humus not only absorbs more water, but holds it more tenaciously in time of drouth than a soil poor in humus. Humus is also an important factor in assisting the capillary rise of subsoil water to the roots of crops. This alone is a sufficient reason for placing a high value upon humus.

The coldness usually associated with humus soils is due to the loss of heat by evaporation of the additional water stored up in the soil, on account of the humus; but after this loss there is yet some heat left for the oxidation of the humus, to aid in warming the soil. Humus also imparts a darker color to the soil, and thus causes it to absorb more of the heat of the sun. The temperature of the soil is more equitable, the difference in favor of humus often being sufficient to ward off early frost and enable the crop to reach full maturity.

On account of the variable composition of humus it is not possible to state the exact amount which should be present in all soils, but it should be in a form that will readily undergo decomposition.

The use of well-prepared farm manures, green manuring and a judicious rotation of crops, are the three most important means of maintaining the humus of the soil.

Another source of humus is muck, which should be dried and used as an absorbent in stables. Clover and other

leguminous plants are also well adapted to increasing the humus, for, while they add an abundance of humus-forming materials, they also add to the soil large amounts of nitrogen drawn principally from the air.

The general laws which apply to the rotation of crops are in perfect accord with the conservation of soil humus; but definite rules cannot be laid down on account of the variations of soil and climate. The conditions must be determined and the proper methods employed for every locality and kind of soil.

In summing up the relations of humus to soil fertility in the various ways mentioned, we will notice:

(1) That the humus of the soil is decreased by the continuous cultivation of those crops which allow of no accumulation of humus. This is followed by a decline in crop-producing power.

(2) The loss of humus involves a loss of nitrogen.

3) The loss of humus decreases the power of the soil to store water.

(4) Humus increases the available plant food of the soil by combining with the potash and phosphoric asid, forming humates, which are readily assimilated by the plants.

(5) It is cheaper to cultivate fertility through the agency of humus than it is to purchase it in the form of commercial fertilizers. Indeed, if the soil contains a very low per cent. of humus it will not yield a full harvest, even by a liberal application of commercial fertilizer.

V. H. DAVIS.

New York State Experiment Station.

September 21st was a banner day in the history of the State Experiment Station at Geneva, N. Y. The occasion was the dedication of the new Dairy and Biological building, which has just been completed at a cost of $41,000. From the supplement to the "Geneva Courier" of September 28th we take the following, which is of especial interest to us, since one person mentioned is now prominent in our own University:

"The New York Agricultural Experiment Station has been in existence about seventeen years. A short history of the different stages of advancement through which this institution has passed since its founding, and the great work it is accomplishing each year, will be of interest to many. The credit of originating the idea of establishing such a station is due to Prof. W. R. Lazenby, who was at the time connected with Cornell University and who is now professor of horticulture and forestry in the Ohio State University. Mr. Peter B. Crandall, of Ithaca, and prominent men all over the state lent their aid and influence to the project, and were associated with Prof. Lazenby in the first agitation and discussion of the matter. The law establishing the station was written by Prof. Lazenby and was passed as he wrote it with the exception that the annual appropriation mentioned was changed from $10,000 to $20,000. The first board of control of the station was comprised of the following well-known men: Robert J. Swan, William A. Armstrong, N. Martin Curtis, Stephen W. Clark, Patrick Barry, Robert J. Dodge, Jabez S. Woodward, Daniel Batchelor and James McCann. All of the above named gentlemen were prominent promoters of the agricultural interests of this state.

"The first director of the station was the late Dr. E. L. Sturtevant, who came to New York from South Framington, Mass. He remained at the head of the institution until December 1, 1887. His successor was the late Dr. Peter Collier, who resigned his position during the summer of 1895 on account of ill health. During the directorship of both of these men great advancement was made along the botanical and horticultural lines and also in the dairy department.

"A number of men now prominent in scientific work in other institutions, were connected with the station during the years of 1882 to 1895. Among them

might be mentioned Dr. S. M. Babcock, now of the University of Wisconsin; Prof. J. C. Arthur, of Purdue University, Indiana; Prof. E. S. Goff, of the University of Wisconsin; Prof. C. S. Plumb, director of the Experiment Station of Indiana; Prof. E. F. Ladd, of the State College of North Dakota; Prof. H. H. Wing, of Cornell University, and Prof. F. E. Emery, of the Experiment Station of North Carolina.

"The building equipment of the Station exclusive of the new building consists at present of one of the finest equipped chemical laboratories in the state, the director's home, with which are connected the station offices, five dwelling houses occupied by members of the station staff, a forcing house plant, covered by over six thousand feet of glass, a complete poultry plant, cold storage house, three great barns, together with many other minor out-buildings. The question might well be asked, 'Where does an institution of this kind receive its support and how?' From a paltry $20,000 a year, the annual appropriation of the state for the support of the work, the amount has gradually been increased until today the station may be considered as including three divisions; first, the effort of general investigation, which is supported by a general fund of $50,000; second, the inspection of commercial fertilizers, which is supported by a fund of $10,000, and third, the conducting of special investigations in the second judicial department, which is supported by a special appropriation of $8000. The appropriation which has been made for five years for the maintenance of investigations in the second judicial department is a recognition of the special conditions which prevail in the territory near the great markets of New York and Brooklyn. A branch station has been established at Jamaica, where experiments have been conducted for the purpose of relieving the great difficulties encountered by market gardeners and forcing house men. While the control of the work is left with the station at Geneva, the staff at Jamaica has been thrown more or less upon their own resources."

Fruit Trees From Cuttings.

(Fred. K. Luke.)

For some years graftage has received the condemnation of some of the leading horticulturists of the old world. They did not hesitate to pronounce it pernicious. The most vigorous opposition to graftage was about fifteen years ago. In recent years we have not heard so much about it. Some of the arguments hurled against graftage by these champions may be of interest today:

First—Grafting is often badly done; unsuitable stocks are frequently used.

Second—Of all forms of grafting, root grafting is most successful and best, as it allows the scion to throw out roots of its own.

Third—The old notion of grafting a weakly variety onto a more vigorous stock is wrong in principle, and very often leads to bad results in practice.

Fourth—The least of two evils is to graft strong growing scions on dwarf stock. Such trees require more constant cultural attention than the same variety on seedlings.

Fifth—Granting that grafting is in some cases expedient, yet it remains an unnatural make shift or sham, and has led and still leads to an enormous loss of growth force.

Sixth—While grafting is, so far as mere stock growing is concerned, very convenient, it may also under its best conditions, viz., suitable stocks and root grafting, be expedient and useful; yet at the present time it is by no means proven that in many cases own root fruit trees would not equal or surpass grafted ones in fertility and durability, etc.

About November 26, 1881, according to "Garden," Vol. XX, p. 539, a Mr. Stevens lost a rose acacia which Mr. J. Van Volxen attributes to grafting. Their argument is that the point of union makes a weak place. Grafted trees, he continues, seldom grow to standard height, and their shape is much altered. In 1889, the editor of one of the leading horticultural papers of England, advanced the following ideas in opposition to grafting:

It is not only that we lose the shrubs by death, disease or canker, but if they do grow on these strong growing stocks, we are prevented from seeing their natural habit.

He attacks nurserymen because they graft, and thinks that buyers should demand stock on own roots.

Arguments like the above naturally led people to wonder how to get stock on own roots. As most of the herbaceous and some of the woody plants are readily grown from cuttings, it was but natural for them to think that fruit trees should be grown in the same way. There followed a period in which this notion had many enthusiastic advocates. Among this number were some who stood high in the horticultural world. To some extent there was some foundation for this new belief. That is some of those who would propagate fruit trees by this new process had made more or less experimental observation along this line. Some came to this conclusion by means of very limited or accidental observation. While a third class either based their argument upon the stories they heard, or they reasoned by analogy, if the willow will grow from cuttings why not the apple? etc. For some years fruit trees were grown from cuttings on a very large scale on paper. I find but very few who have actually experimented along this line.

When we undertake to grow a plant from cuttings, we must consider not the plant alone, but the conditions we can give it as well. We do not always fully realize how difficult a matter it is to control conditions. I have no doubt that most any tree can be grown from cuttings if we can give those cuttings just the conditions they want. But right there in the conditions we meet an obstacle which is not easily overcome. Since I began work on this subject I have handled 7396 cuttings and am led to believe that nearly each variety demands conditions a little different from any other variety.

Before I give any definite results, it may be profitable to give a plan of the work pursued. When we decided to study the propagation of fruit trees from cuttings, we could learn of no one who had any definite knowledge on such a subject. The only way for us to get any information was to go to work. We chose the apple, pear, plum and grape. In the latter both scion and root cuttings were made and each cut into three lengths, 1 in., 3 in. and 6 in. In case of each of the others both scion and root cuttings were made as follows. The scions were cut from three seasons' growth, each of which was cut into three lengths, the same as the grape.

The roots were graded according to diameter as accurately as was possible, viz., $\frac{1}{2}$ in., $\frac{1}{4}$ in. and less than $\frac{1}{4}$ in., each of which were cut into three lengths the same as the scions. This gives us 18 lots of cuttings of each fruit except the grape, of which we have but 6 so far. Each one of these lots was further divided into 2 equal of 12 cuttings each. This division was made that we could test them in two different temperatures. One bed had a bottom heat of about 77 degrees, while that of the other was about 64 degrees. The matter of callusing them before putting them in the bed. So while this first lot was put in the beds without callus, a second lot, just like the first, only larger in number, was put in sand in an inverted position to encourage callus formation.

After three months of patient watching and care we noted the first bed as failures and proceeded to put in the lot we had intrusted to the callusing pit for a time.

The average bottom heat of these beds was about 77 degrees and 64 degrees respectively. After we had filled these two beds in the same manner as the previous manner, we found that we could make good use of the surplus cuttings we had put in the callusing pit. Some people believed that if cuttings come in contact with some form of earthenware such as pots or tile they would root better. To test this two beds, Nos. 3 and 4, were made, one having a brick bottom, while the other was an ordinary bottom, serving as a check.

Each of the three large fruits was further subjected to two treatments in pot culture. Six-inch and three-inch cuttings were inserted in the sand in such a way that the rooting end should come in contact with the side of the pot.

Three-year-old trees of apple, pear and plum, and one-year-old grape were forced in the house until they had new growth of sufficient length, when cuttings were made and intrusted to the various beds. Of these green cuttings we also put a few in the regular cutting bed of the horticultural department, in which begonias, chrysanthemums, fuchsia, etc., rooted readily.

In the minds of some the cuttings would root best if kept in a close atmosphere and a steady temperature. Such conditions are difficult to obtain in a large house heated by the regular heating plant, which furnishes heat for all the other houses. A small bed was constructed, heated by a lamp, in which the temperature and ventilation were under the control of the operator.

With all of the above devices as applied to the second lot of cuttings we gave the grape 18 distinct treatments, and each of the other fruits 48 distinct treatments.

APPLES.

When we took final notes we observed that in case of the apple all of the scion cuttings had failed to strike root. Of the apple root cuttings, in low bottom heat, of the 6 in. long and $\frac{1}{2}$ in. diameter, 5 rooted; while of the $\frac{1}{4}$ in. diameter the following number had rooted: Of the 6 in. long 3 cuttings; of the 3 in. long 2 cuttings, and of the 1 in. long 1 cutting. Of those less than $\frac{1}{4}$ in. in diameter the 6 in. long gave 4 rooted cuttings. All the remainder of the cuttings in low bottom heat gave negative results. In the bed with high bottom heat, of the 1 in. long and $\frac{1}{2}$ in diameter, 1 rooted. All the rest were negative.

GRAPES.

In the bed with low bottom heat we rooted 4 scions 6 in. long, 4 that were 3 in. long, and 5 that were 1 in. long. In the bed with high bottom heat 9 scions of the 6 in. long, 5 of the 3 in. long and 1 of the green cuttings rooted. In the bed which served as a check for the one with brick bottom, but 1 green cutting rooted, and in the department bed but 4 green cuttings rooted. All the rest were dead.

PEARS.

The scion cuttings in all of the beds failed to strike root. With the root cuttings it was slightly different. In low bottom heat, of the 6 in. long and $\frac{1}{2}$ in. diameter 4 rooted. In the bed of close atmosphere, of the 6 in. long and $\frac{1}{4}$ in. diameter, 5 rooted, and of the 3 in. long and $\frac{1}{4}$ in. diameter, 1 rooted. All the rest gave negative results.

PLUMS.

None of the scions rooted. Of the root cuttings in low bottom heat 1 rooted and in close atmosphere 1. Both of these were of the 6 in. long and $\frac{1}{4}$ in. diameter.

In all, in this lot, we had 1500 scion cuttings, of which 33 rooted, all of which were grape. There were 748 root cuttings, of which 31 rooted, 19 of which were apple, 10 pear and 2 plum. Of the total 2249 cuttings in this lot only 64 rooted.

This is not very encouraging. It is hardly to be hoped thus far that it can ever be of commercial value in general. The work just concluded leads me to think that if there is anything in it the

secret must rest with the variety. I believe that some varieties will root more readily than others. The Parry-Pomona Nursery has Kieffer pears on own roots, grown from cuttings. They send their cuttings south about the beginning of the year and have them rooted there. They send south to get a longer season.

We have taken up the study of varieties now. We use at present cuttings 6 in. long and of the current season's growth. We use two beds, one of good bottom heat, and one without bottom heat. When the cuttings are made they are inverted in a box of moist sand, and all covered up. This is done to develop callus. As soon as callus is as well developed as possible they are put in the beds, leaving only about an inch of the top exposed. In this way, the past winter, we tested some 50 varieties of plums, 20 of pears, 5 of appricots and 3 of peaches. We used 2996 cuttings in all, of which 85 rooted. Of these, in high bottom heat, 55 were plums and 4 pears, while in no bottom heat 26 were plums, while the pears were negative. The appricots and peaches were likewise negative. In the following table, which gives the varieties that rooted, the first two columns are high bottom heat, while the two remaining are without bottom heat:

	No. used.	No. rooted	No. used.	No. rooted
Damson	20	3	20	10
Clyman	19	8	20	7
Reine Claude	20	3	20	0
Mariana	44	34	45	6
Moone's Arctic	18	6	20	2
Jefferson	19	0	20	1
Prunus Simonii	20	1	20	0
PEARS.				
Jos de Maliner	8	2	8	0
Kieffer	19	2	17	0

This shows that the high bottom heat was preferred. In the bed with no bottom heat there was an enormous callus development on Clapp's Favorite, Tyson, Vermont Beauty, Summer Doyne, Boussack and Lawrence pear. On Louis Bonne, Sheldon, Howell and Duchess there was an unusual callus development, but not to such an extent as in the former.

There are yet many things to be considered before we utterly condemn the subject. Different ages of the scion may have considerable to do with it. Growing them in beds out of doors has been in our minds for some time and will be tested as soon as circumstances will permit. The length of the cuttings may yet be of more prominence than we think. The mode of inserting them in the bed may be a secret worth knowing. Thus there are yet many ways to be studied before we can give definite results.

Sugar Beets on the University Farm.

During the past few years much interest has been manifested in the manufacture of sugar from the sugar beet in the United States. Samples of seed were sent out by the Department of Agriculture to all parts of the country where it was thought the plant could be grown. Many of the state boards of agriculture and experiment stations also took part in distributing seed. As a result of this work, much valuable information has been gathered as to the yield and quality of beets produced and the localities best adapted to produce the crop. In general the beet zone in the United States is where the average temperature for June, July and August is 70 degrees. This area includes Massachusetts, Connecticut, southern New York, Pennsylvania, northern Ohio, northern Illinois, northern Indiana, southern Michigan, southern Wisconsin, southern Minnesota and South Dakota. From the last named state the zone passes through Nebraska and Colorado and into New Mexico; thence north to Utah and across Nevada into California, the Pacific slope in the latter state seeming to be especially adapted to the plant. Factories are in operation in the following states: Two each in New York, Nebraska, and Utah; one each in Michi-

gan and New Mexico; and eight in California.

During the past summer one-half acre of sugar beets were grown on the alluvial first bottom soil of the University Farm from seed sent out by the United States Department of Agriculture and including two well known varieties, the Kleinwanzlebener and Vilmorins Improved. The soil was prepared by plowing seven inches deep and subsoiling seven inches, making a depth of fourteen inches of soil stirred. A loose deep soil is essential to a perfect development of full sized beets. As a preparation for seeding, the ground was disked twice, rolled twice and dragged. Seed was sown May 26th with a hand drill at the rate of 15 pounds per acre in rows 28 inches apart.

Subsequent cultivation was done by hand mainly. The young plants are very tender and easily injured, thus necessitating careful hand hoeing next to the row. The hand cultivator was found useful in stirring the middle between rows, although this part of the work might be done with a horse cultivator. In all, four cultivations were given during the season; this number being sufficient to keep the soil loose and the weeds down. When the plants were about ten inches high they were thinned to one plant every eight inches. The season was favorable for the growth of the crop; but, notwithstanding this fact, the yield and quality of beets was disappointing. The two varieties yielded about the same in quality and quantity of beets. The average yield per acre was 8½ tons—but little more than half of a good yield.

Samples of the beets analyzed by the Division of Chemistry, United States Department of Agriculture, contained 10.6 per cent. of sugar with a purity co-efficient of 78.8 per cent., both of which are rather below the standard.

For the profitable manufacture of sugar, beets should yield 14 to 18 tons, and contain 12 to 15 per cent of sugar with a purity coefficient not less than 80 per cent.; that is, eighty per cent. of the sugar in the solid matter of the juice should be available.

The experience of this year and of former years on the fertile soils of the University Farm, and also the experience of farmers living in this section indicate that it would be unprofitable to attempt to grow sugar beets for the manufacture of sugar in this part of the state.

W. D. GIBBS.

The Peach Crop of Central Ohio.

We are glad to see that our alumni are wide awake to their interests and to the interests of others as well. The following letter appeared in "The Country Gentleman" of October 20, and we deem it worthy of reproduction. The writer of this letter is now holding the fellowship in agriculture at Cornell University:

"The harvest of a large, and in some ways disappointing, peach crop has just ended in central Ohio. Now that the rush of the season is over, it will be of interest for us to stop and note some of the peculiarities of the crop.

The leaf curl was very prevalent in the orchards early in the spring, whether on account of the wet weather of the latter part of April and early part of May I do not know; but it was the general opinion of peach growers that the wet weather was largely responsible for it. But the damage from the curl was not as great as anticipated. Many of the leaves affected by the curl, in fact most of them, dropped off. This cut short the supply of nourishment to the tree, and on trees that had set full of fruit the peaches began to drop, and at once the report was heralded abroad that the peaches were all dropping. However, the dropping did very little damage, since most of the trees had set too much fruit, and the dropping thinned them.

"The earliest varieties, Alexander, Amsden and Waterloo, rotted very badly, as they usually do, and they were ten

days to two weeks later ripening than they were two years ago. Then I marketed my first peaches on the 28th of June; this year it was the 12th of July before I had any peaches to sell. The Early Rivers rotted to some extent this year also, but not so badly as the earlier varieties. But I believe rotting was the common complaint up to the last week of August until the dry weather from which we afterward suffered, set in. Dealers were slow to handle any quantity because they would "go down" so quickly. The abnormal and premature ripening of the fruit was very noticeable in many orchards. One part of the tree would ripen its peaches and on another part of the same tree they would be entirely green. Those peaches that ripened prematurely, while naturally perfect freestones in many cases, clung very strongly to the seed. If this fruit was not picked as soon as or before it ripened, it would rot or blast in a very short time. Then fruit that ripened prematurely was often dotted with red spots, which ran into the flesh, and the foliage of the tree often showed a yellowish cast. These were all symptoms of peach yellows, and alarm was expressed among growers lest yellows had crept into their orchards. But some of the most pronounced symptoms of yellows were entirely lacking; the bushy, willowy growth of many fine shoots in the center of the trees could not be seen in any case, and the opening of next spring's buds in late summer was also lacking. Peach growers began, after examination, to console themselves by attributing these peculiarities to the condition of season in temperature and moisture, and in some cases to the natural decline of the trees. However these orchards will be watched with anxiety for further developments next year.

"The prices realized from the crop were low, although probably a little higher than those of two years ago. Probably the net price per bushel will fall somewhere between 60 and 70 cents. The crop as a whole was inferior in quality; while there was ready sale for choice peaches at one dollar a bushel almost the entire season, inferior peaches were a drug at fifty cents.

"One thing that growers had strongly impressed on them this season was the necessity of raising a large peach. If a peach is big, it will sell irrespective of quality. Especially is this true of shipping markets. Next to size, color is to be sought. If a peach is off in size and is well colored, it will sell; and lastly, the quality of the peach is to be considered. If all three of these can be combined in one peach, well and good, but if they must be taken separately, they should be taken in the order named by the commercial peach grower of central Ohio. Where one will stop and buy a small peach of excellent quality, ten will pass on and buy the large peaches without thinking of their quality.

"The varieties that have given the best satisfaction this season are among the following, and ripen in order named: The Early Rivers—nothing before the Rivers is worth planting, none of them being entirely free, and all of them liable to rot. The Early York is still a standard; although not large, it usually is well colored. Early Crawford is a prolific bearer and should be thinned. The Mountain Rose, although an old variety, I believe is growing in popularity every year. It is a peach that sells itself, good size, good color, good quality. The Elberta, although it has only fruited a couple of times for the growers, has given entire satisfaction, and will occupy large parts of the new orchards that are set. Fal's Seedling, Beer's Smock, Smock Late Free and Salway were the most satisfactory late varieties. It is the late varieties that the commercial grower must chiefly raise. They yield better, ship better and sell better than the early varieties. The market at Newark was clogged with peaches up to the 10th of September, and shipping markets were unreliable. Then the market became more active, shipping

demand was good, and large quantities could be sold without difficulty.

"The competition has become so sharp in growing and selling peaches in Licking county that the successful grower must be on the alert to adapt himself to his environment. He must watch his markets, his orchards, his varieties, and produce only the best. For the best there is always a demand at a good price, and it is the man who supplies this demand that will make money out of growing peaches.

HOMER C. PRICE.

Licking County, O.

Milk Fever in the Cow.

This disease occurs in cows near the time of parturition, and is due to the absorption of toxic products from the womb. Almost all dairy and stock men have had more or less experience with this disease, usually to their sorrow, for it is one which causes great loss, especially to dairy men, affecting as it does the most valuable cows in the herd. It has been known for many ages, and its cause has given rise to many theories. The one which seems most plausible, and which is generally accepted is, that it is caused by the absorption of the putrid toxic products from the uterus, or womb; or in other words, that it is a ptomaine poisoning. The ptomaines are the product of certain germs and are very poisonous to the animal system. Ptomaine poisoning often occurs in man from eating spoiled meats.

The uterus, and in fact the whole reproductive system of the cow represents a natural culture chamber for the germs which produce toxic products. These germs may be conveyed into the uterus by the atmosphere while the os-uteri, or opening between the vagina and uterus, is relaxed; or by the hands and instruments of the veterinarian. Once these germs find lodgement in the uterus, where they are excluded from the air, they are in a favorable situation to manufacture the deadly ptomaines or leucomaines, the absorption of which by the mucus membrane of the uterus causes this fatal disease.

The normal uterine mucus membrane is favorably situated both anatomically and physiologically for the absorption of these dissolved chemical substances, being, as it is, permeated by a large number of blood and lymph vessels. Hence on postmortem we seldom find any lesions or anatomical alterations of the tissues of the womb.

It is a remarkable fact that this disease occurs most commonly in cows which have calved easily. This is explained by the fact that in such cases the os-uteri remains relaxed for a greater length of time than it does in cases of difficult parturition. Milk fever generally occurs in cows which are heavy milkers, and great eaters. Keeping the amimals in permanent stabling, and feeding large quantities of rich food while they are giving no milk are predisposing causes.

The disease makes its appearance usually in from twenty-four to forty-eight hours after parturition. It seldom occurs after the third day, and some authors state that it has never been recognized before the starting of the milk secretion. The most salient symptoms to the average laymen would perhaps be, the anxious expression of the animal, bellowing and mounting into the manger. Later they become very weak, stagger and fall, and are unable to rise. The members are usually extended in a rigid position. A rattling or whistling noise is heard in case the larynx is paralized. The feet, ears and horns feel cold to the touch. When a case is going to recover we see improvement as early as the second or third day. Recovery is usually complete at the end of from two to five days. About fifty per cent. of the animals affected never recover.

Milk fever is one of the cases where the old maxim: An ounce of prevention is worth a pound of cure, is doubly applicable. Hence prophylactic measures

are to be urgently recommended. If proper precautions were taken a large number of cases could be prevented. Give the pregnant animals daily exercise, and decrease their allowance of food.

It is our custom here on the O. S. U. farm to shut off all grain feed after the cow has been turned dry, and feed nothing but hay or light rough foods. Green grass is, perhaps, the ideal food, as there are few cases of milk fever on record where the cows were running on pasture at the time of parturition. If the cows are constipated give them a pound of epsom salts, and keep the bowels open. Cold should also be guarded against, in short keep the animal's system in good condition, and no not allow them to fatten up before calving. Antiseptic washings are also to be recommended. Take a two percent. solution of either carbolic acid or creoline and cleanse out the uterus after parturition.

When the disease exists it is advisable in all cases to consult a veterinarian. Unless well up on these matters the owner should use great caution about drenching animals suffering from this disease, as the medicine may go the wrong way and cause foreign body pneumonia.

M. IMES.

"Grafting."

Grafting is a very ancient practice, having been well known to the Greeks and Romans. The French, who are most expert in grafting have practiced many different modes and succeeded in the last few years in grafting annual plants, such as the tomato, the dahlia, and the like.

The success of grafting depends upon the power of union between the young tissue. When the cambium or growing layers have been placed nicely in contact, the ascending sap of the stock passes into and sustains the life of the scion.

The proper time for grafting fruit trees is in the spring as soon as the sap is in motion. This varies with different trees, the cherry and plum having the earliest sap flow and the pear and apple the latest. The precise time varies of course with season and climate.

The scions are generally selected some time previous to grafting, either in winter or very early spring, choosing only the straight thrifty shoots of last year's growth, growing near the center or the top of the tree.

The stock should be a tree that has been standing at least a year upon the ground where it is grafted.

The uses of grafting and budding as applied to fruit trees may be briefly stated as follows:

First—The rapid increase or propagation of valuable sorts of fruits not easily raised from seeds, or cuttings, as is the case with nearly all our cultivated fruits.

Second—To renew or alter the heads of trees by heading in, and grafting a new head, bearing the finest of fruit on a formerly worthless tree.

Third—To render certain foreign and delicate sorts of fruit more hardy by grafting them on robust stocks of some species native to the country, as a foreign grape upon a native.

Fourth—To dwarf certain kinds of fruit by grafting them on suitable stocks of slower growth as in case of pear on quince.

Fifth—To hasten the bearing of seedling varieties of fruits by grafting them on the full grown or mature bearing trees causing them to fruit several years earlier.

Grafting is confined within certain limits. Students in the Horticultural course at the State University have made continued experiments along these lines and verified the law that scions will only succeed on trees that are closely related to each other.

Last spring the class grafted the pear upon the apple and this summer the pear scion had made a good growth and bore some fruit. They also tried the horse chestnut and buckeye, and drooping ash on white ash, which grew very well. The cherry and plum were tried, but they

did not unite well and died in a short time.

The ancients boasted of grafting vines and apples upon poplars and elms, but repeated experiments by most skillful cultivators of modern times have clearly demonstrated that, although we may in a thousand trials succeed in effecting these unions, yet the graft invariably dies after a few months' growth.

LEONARD C. WARDEN.

Corn Harvesting.

Rapid progress has been made in the harvesting of corn during the last few years.

Although many farmers are still to be convinced of the utility of the new way of doing this work, yet I think this method has come to stay.

The corn harvesters are so efficient now that they do the work rapidly and well and at the same time save a great deal of hard labor. With such a machine, a team and three men, from seven to eight acres can be cut, bound and shocked per day with comparative ease. By having the stalks bound in bundles larger shocks can be made without any fear of the corn ever getting moldy. It also leaves the fodder in better shape, because there is not so much of it exposed to the weather. About 30 to 40 bundles can easily be placed to a shock.

After the corn is thoroughly dry it should be hauled up and stacked or stored in the barn for several weeks in order to have it go through the so-called "sweating stage." After this the corn can be husked with a corn-husking machine, and the fodder shredded without any danger of its ever becoming heated or moldy. This is an important point in the new method, and one that farmers ought to take into account. For as soon as the corn is husked out of the field without being stacked or put through this curing process the shred fodder is sure to heat and mold.

For this reason, principally, farmers are opposed to having their corn husked with a machine—a thing which has up to this time interfered to a great extent with the practicability of the corn huskers.

It is admitted by the majority of farmers who have used these machines that the work is done well and probably rapidly enough. This, however, varies with the size of the husker used. The largest husker on the market now has a capacity of 1500 bushels per day. So, in conclusion, the principal objection found is, that with such a machine the fodder must be shredded, leaving it in a rather bulky form, and if stored in large heaps when cut from the field it will soon spoil. If the farmer will take the precaution to stack his fodder first before shredding he will always find it in excellent shape.

Not until then can the superiority of the new method be realized.

OSCAR ERF.

The Theory of Phagocytosis.

Bacteria are plants and not animals as is commonly supposed. They are universally distributed, no place where the air can circulate in currents is free from them; while many of them are our friends, a large number known as pathogenic, or disease producing, are the deadliest enemies of animal life. All the so called contagious and infectious diseases are caused by germ life.

The germs themselves are not the direct cause of the disease which is attributed to them, but the disease is directly due to a toxic albumen which the germs manufacture. For example, a few millions of bacteria in the foot would not especially inconvenience anybody if they remain in a passive state, but let a few tetanus germs enter a traumatism or wound caused by rusty nail, and if the conditions are favorable, they will rapidly multiply and cause a severe case of tetanus or what is commonly known as lockjaw. Now, the germs of tetanus are of the anatobic type, that is they can not live in the presence of oxygen, hence when they are introduced into a wound,

they do not circulate or spread, but remain localized in the region where they were introduced. Now we know that lockjaw or tetanus affects the whole muscular system; how is this brought about if the germs remain localized? Well, the tetanus is not caused by the germs themselves, but they secrete a toxic product which is a virulent poison to the animal system; so poisonous is it that five-thousandths part of a milligram is sufficient to kill a man. This toxic product, the action of which causes the disease, is thrown into the blood and carried all over the system causing the well-known symptoms of lockjaw. When the substance comes in contact with the cells of the tissue it produces an irritating effect upon them, and they, acting under the stimulus of this irritation, secrete a chemical substance known as anti-toxine, so called because it has a neutralizing effect upon the toxines secreted by the germs.

The above is known as the theory of phagocytosis, and it marks a rapid stride in the science of medicine. The theory is a very plausible one and has many facts to back it. We know from experience that the weaker organisms, whose cells would not be in a condition to secrete this neutralizing substance, succumb to disease much more readily than the robust, energetic organism.

The new cure for diptheria which is a rousing success, and of which we read so much a few months ago, is founded upon this theory, and is prepared in the following manner: Usually a healthy horse is taken and inoculated with about five drops of toxine from diptheria germs. After the fever subsides, say the second day he is inoculated with about ten drops and this process is continued gradually increasing the dose until the horse can stand about one-fourth of a pint, he is then considered immune. An artery is then tapped and a quantity of blood drawn off, after this stands for a short time, the clot will separate and have a clear serum. This serum contains the anti-toxine which was secreted by the cells. It is then bottled and placed on the market as anti-toxine for diptheria. Diptheria patients, whose bodies are so weak that the cells are unable to secrete a sufficient quantity of anti-toxine, are greatly benefited by having a quantity of this injected into the system.

Rabies or hydrophobia, or mad dog bite, as it is commonly called, is treated in much the same manner. Germs of Rabies are injected into a rabbit which dies from the effects, its brain and spinal cord is taken, and put in a bottle tightly corked. After fifteen days the poison in the cord and brain becomes weaker and the patients are inoculated with this the first day, on the second day they are given some from a brain and cord 14 days old, on third day from one 13 days old and so on until they can stand the fresh poison. They are then immunes. The germs of Rabies have no effect on them.

This briefly is the plan on which bacteriological disease are coming to be treated and from the present effects, we are justified in predicting wonderful results in the future. M. I.

Of the seventy odd millions of people who inhabit the United States, more than two-fifths get their living by husbandry direct, and more than one-half our people are engaged more or less in the profession of agriculture.

Ninety-three per cent. of the thirty-seven and one-half million people inhabiting the Gangetic Valley, British India, are engaged in agriculture.

Prince Bismarck, the "Iron Chancellor," notwithstanding his great official responsibility, found time to superintend the operations of a large farm.

Profligate nature, in her abundant generosity has blessed us with more than we can rightly manage. The agriculturist of the future will make a living out of what we waste today.

DAIRY AND BIOLOGICAL BUILDING, NEW YORK AGRICULTURAL EXPERIMENT STATION, GENEVA, N. Y.